



# **An Investigation of Class Size on Teaching and Learning of Mathematics in Secondary Schools (A Case Study of Chikun Local Government Area) of Kaduna State, Nigeria**

**B. Y. Afolabi<sup>1\*</sup>, L. B. Wakili<sup>2</sup>, A. O. Afolabi<sup>3</sup>, N. E. Onwuegbunam<sup>3</sup>  
and A. A. Ademuwagun<sup>3</sup>**

<sup>1</sup>*Elson Academy, Tsohon Kamazou, Ibrahim Yakowa Way, Janruwa, Kaduna, Nigeria.*

<sup>2</sup>*Nigerian Airforce Base (NAFBASE) Secondary School, Kaduna, Nigeria.*

<sup>3</sup>*Federal College of Forestry Mechanisation Afaka Kaduna, Forestry Research Institute of Nigeria, Nigeria.*

## **Authors' contributions**

*This work was carried out in collaboration among all authors. Author BYA designed the study, wrote the protocol and wrote the first draft of the manuscript. Author LBW supervised the research study.*

*Author AOA managed the literature searches, performed the statistical analysis and analyzed the results. Author NEO managed the drafts. Author AAA supported the research work. All authors read and approved the final manuscript.*

## **Article Information**

DOI: 10.9734/JESBS/2020/v33i1030263

Editor(s):

(1) Dr. Prince Nwachukwu Ololube, Ignatius Ajuru University of Education, Nigeria.

Reviewers:

(1) Oktovianus Nau Lalian, Universitas Negeri Jakarta, Indonesia.

(2) Vlad Bocanet, Technical University of Cluj-Napoca, Romania.

(3) Manuel Jesus Ibarra Cabrera, Universidad Nacional Micaela Batidas de Apurimac, Peru.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/62110>

**Original Research Article**

**Received 28 August 2020**

**Accepted 02 November 2020**

**Published 21 November 2020**

## **ABSTRACT**

The correlation between class size and mathematics learning by students has been a subject of research for years. This work studied the effects of class size on the teaching and learning of mathematics in junior secondary schools in Chikun Local Government Area (LGA) of Kaduna State, Nigeria. The sample was made up of 100 students and 20 mathematics teachers randomly selected from the population. Questionnaires were administered to respondents for data collection after reliability and validation techniques were applied on the scales. The data were analysed in

\*Corresponding author: E-mail: [bukolademo123@gmail.com](mailto:bukolademo123@gmail.com), [demoafolabi@gmail.com](mailto:demoafolabi@gmail.com);

percentages and means. Pearson correlation analysis was applied on the variables in order to ascertain the level of correlation. It was found that class size affects class control, students' interest and attention and the time expended in dealing with disciplinary issues in a mathematics class. It is recommended that future research be conducted that will collaborate the importance of class size on students' learning process and achievement. The recommendations of the National Policy on Education (NPE) regarding student-teacher ratio should be implemented and teachers should be properly trained.

*Keywords: Effects; class size; mathematics; teaching; learning; respondents.*

## 1. INTRODUCTION

The economic goals of the twenty-first century may not be realized without adequate attention given to the teaching and learning of mathematics at all levels of the schools system of education Agah [1,2].

Yara and Otieno [3] defined mathematics as creation of the human mind concerned primarily with ideas, processes and reasoning. The subject is so important that Gouba [4] concluded that students who chose not to take mathematics seriously in high school forfeit many future career opportunities they could have. This is because most degrees in physical sciences, life and health sciences, social sciences, business and commerce require a good knowledge of mathematics and statistics.

Despite the importance of mathematics and a compulsory requirement for gaining admissions into Tertiary Institutions in Nigeria, the problem of mass failure across the different levels of education is a common knowledge. This problem has been attributed to many factors such as poor teaching techniques, hatred for the subject, laziness, and lack of textbooks Laju [5].

Olatunde [6] and Sa'ad et al. [7] reported that class size has been identified as an important factor in student achievement in mathematics. In a large class, students can become faces instead of people, it is harder to give individual advice to students and monitor their progress due to reduced quality of feedback. This is especially serious because learning mathematics is a process that requires active involvement [8].

According to Ayeni and Olowe [9] class size refers to the number of students in a given course or classroom, specifically either the number of students being taught by an individual teacher in a course or classroom or the average number of students being taught by teachers in a school or educational system.

Responding to this problem of over-bloated class, some state governments in Nigeria embarked on correcting this anomaly by reducing the numbers of students per class especially at the junior secondary school level and more classrooms were built to cater for this reformation. This brought a great relief upon teachers and administrators of schools and there was a great expectation that with this reformation, there should be an improvement in the output of teachers and this should consequently improve the academic performance of the students [10].

### 1.1 Concept of Class Size and Achievement

The National Policy on Education (NPE) [11] stipulated a teacher - pupil ratio of 1:35 in secondary schools for effective teaching and learning and a ratio of 1:20 for practical works. Ajao [12] however reported that all over the nation, teachers now have to deal with an average of 100 students in a class in public schools and as high as 50 students in a class in some private schools.

Large classes present more challenges for classroom management, pupil control, and marking, planning, and assessment. Teachers are put under more strain when faced with large classes [9].

Teachers and parents agree that smaller classes are better for learning but sometimes in a bid to cut cost, school administrators battling with tight budgets want a bigger class size [13]. Many parents use the criterion of class size to determine the school to take their children; therefore it is safe to say that all stakeholders in education are interested in the matter of the number of students in a classroom at a time.

Empirical findings indicate that class size expansion may reduce academic gains for low effort students more than high efforts students and reduce the likelihood of receiving an 'A' [14].

However, other studies cast doubt on the correlation between class size and student learning. In a study to determine the effects of students' achievement in a rural state, Kornfeld [15] asserted that class size does not significantly affect students' academic achievement in Vermont. In his opinion, the difference in class size is not related to test scores or graduation rates. This is similar to the findings of Ngoboka and Schultz [16] who concluded that there is no evidence to support hypotheses that academic performance is higher for students in small classes than those in larger classes.

On the contrary, Keil and Partell [17] found that increasing class size has a negative effect on students' achievement. Uhrain [18] stated that Owoeye and Yara [19] in their research study of 50 secondary schools in Nigeria to determine the effect of class size on students' achievement found that there was no significant difference between small classes and large classes in both urban and rural communities.

## **1.2 Influence of Class Size on the Teaching of Mathematics**

Mathematics is one of the most phobia generated subjects in the school curriculum. This can be partly attributed to the way it is introduced to learners. Teaching and learning mathematics are complex tasks but students' motivation can be highly influenced by instructional practices [20].

According to a study conducted by Leon [21], teachers selected immediate classroom situations as one of the factors that influenced the understanding of good mathematics teaching.

Teaching large classes has been found to adversely affect morale, motivation and self-esteem of teachers National Centre for Education Statistics [22]. A consistent relationship was found between class size and teaching by Blatchford et al. [23], they found that the larger the class the more non-teaching time.

## **1.3 Effects of Class Size on Learning of Mathematics**

Many studies have shown that class size is an important factor that determines how much students learn. Sa'ad, Adamu and Sadiq [7] concluded that overcrowded mathematics class

is one of the causes of poor performance in mathematics in public schools in Azare metropolis of Bauchi State, Nigeria. This finding agrees with the findings of Olatunde [6] that class size is directly related to the performance of students. It was suggested that class sizes should be moderate in order to help students who may have problems understanding the concept being taught.

Other studies suggested that class size improves students' academic achievement [24,25]. Babcock and Betts [14] found that teachers are able to offer special help to low-achieving students and effectively control the low-effort students in smaller classes. Blatchford, Basset and Brown [26] in a study found that there was a tendency for more on task and less off-task behaviour as class decreased.

## **1.4 Statement of the Problem**

Class size is an on-going issue in education worldwide and Nigeria is not an exception. In Nigeria, class size continues to rise because of ever increasing numbers of students at all levels of education due to increase in enrolment to schools. This is further complicated by lack of infrastructure to cater for the yearly increase being experienced. Inadequate number of classrooms result in students being crammed into the available spaces to learn. In view of the importance of mathematics to an individual student and national development, the teaching and learning of the subject is to be critically examined to properly understand the effects of mathematics teaching in large classes.

## **1.5 Purpose of the Study**

Specifically, this study is to examine:

- The effects of class size on teaching and learning of mathematics in junior secondary schools in Chikun Local Government Area (L.G.A) of Kaduna State, Nigeria.

## **1.6 Significance of the Study**

The study will be beneficial to policy makers, school planners and administrators, teachers and students who are stakeholders in the teaching and learning of mathematics in secondary schools in Chikun L.G.A of Kaduna State.

## **1.7 Research Questions**

The following research questions are expected to be answered.

- Is there a correlation between the variables?
- How does class size affect the teaching and learning of mathematics in junior secondary schools in Chikun L.G.A of Kaduna State?

## 2. RESEARCH METHODOLOGY

The study focused on the effects of class size on teaching and learning of mathematics using some selected public secondary schools in *Chikun* Local Government Area of Kaduna State as a case study. The study was conducted during the 2016/2017 academic session in Kaduna State. Teachers and students' structured questionnaires were prepared and administered to randomly selected mathematics teachers and students in the junior secondary section. The questionnaire for teachers consisted of 8-items based on a 4-point Likert scale measuring their perception on the effects of class size on the teaching and learning of mathematics. The questionnaire for students consisted of 4-items on a 4-point Likert scale. The responses were rated as: Strongly Agree = 4, Agree = 3, Disagree = 2, Strongly Disagree = 1.

### 2.1 Design of the Study

The study employed descriptive survey design to identify and analyse the effects of class size on the teaching and learning of mathematics. This was done using an 8-item questionnaire for teachers and 4-item questionnaire for students based on Likert Scale to gather quantitative data for the study.

### 2.2 Area of the Study

The study was carried out in secondary schools randomly selected within *Chikun* L.G.A. of the State. It was limited to teachers and students of junior level classes of the schools. The choice of area was based on familiarity of the locality to the researcher which made data collection effective.

### 2.3 Population of the Study

The population of the study consisted of mathematics teachers and students of the selected schools. The data was obtained from the Ministry of Education (MOE) Kaduna in 2016. The data showed that there are 17 public secondary schools, 41 mathematics teachers and 16,475 mathematics students in *Chikun* L.G.A. of the State.

### 2.4 Sample and Sampling Techniques

The researcher adopted the random sampling technique for this study. The sample consists of 20 mathematics teachers and 100 junior secondary school students randomly selected from 10 schools within the study area.

### 2.5 Instrument for Data Collection

The instrument used for this study was an 8-item teacher questionnaire and a 4-item student questionnaire extracted from an entire body of study. The teacher questionnaire consists of 3 sections. Section A consists of personal data of the respondent; Section B contains questions about the teacher's class and class size and Section C consists of questions on the impact of class size on the teaching of mathematics. The student questionnaire consists of questions on impact of class size on learning and students' achievement. A 4-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree" was used to determine respondents' feelings.

### 2.6 Validation of the Instrument

Ascertaining the content validity involved several consultations with the research supervisor and application of reliability and validation tests. The reliability of the items scales was assessed with Cronbach's Alpha on the items-scale. Pearson correlation technique was applied on items for scale validation using SPSS 15.0 version which led to evaluation and improvement of the questionnaire.

### 2.7 Method of Data Collection

The researcher distributed the questionnaire to mathematics teachers and students in sampled schools using hand to hand method. A total number of 100 student questionnaires and 20 teacher questionnaires were administered. The responses were rated as Strongly Agree = 4, Agree = 3, Disagree = 2 and Strongly Disagree = 1.

### 2.8 Method of Data Analysis

Quantitative data were obtained from closed ended questions. Data were grouped into different categories consistent with the research questions. A simple descriptive statistics was used in analysing the data in order to determine the percentage of responses and the mean

response respectively. Deductions and generalizations were made using patterns and trends of responses.

$$\text{Percentage} = \frac{\text{Number of Responses}}{\text{Total Number of Respondents}} * 100 (\%) \quad (1)$$

$$\text{Mean (X)} = \frac{\sum \text{Number of Responses} \times \text{Rating}}{\text{Total Number of Respondents}} \quad (2)$$

### 3. RESULTS AND DISCUSSION

#### 3.1 Results

The results of the respondents' (teachers and students) data analyses are shown in Tables 1 and 2.

From Table 1, data analysis of reliability of the 8-item-scale shows that a reliability coefficient of 0.96 was obtained as Cronbach's alpha for

teachers' response for internal consistency. Similarly, Table 2 shows a reliability coefficient of 0.83 as Cronbach's alpha for the 4-item scale on the effects of class size on learning of mathematics in the selected junior secondary schools within the local government area.

Table 3 shows Cronbach alpha coefficients for internal consistency of reliability on teachers' response on the 8-item scale.

Similarly, Table 4 shows Cronbach alpha coefficients for internal consistency of reliability on students' response on the 4-item scale.

Table 5 shows the result of inter-item correlation matrix on teachers' response on the 8-item scale for class size as affected by teaching and learning of mathematics in *Chikun* L.G.A. of Kaduna state.

**Table 1. Reliability statistics of the scale (Teachers)  
Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha based on standardized items	Number of items
.957	.966	8

**Table 2. Reliability statistics of the scale (Students)  
Reliability Statistics**

Cronbach's Alpha	Cronbach's Alpha based on standardized items	Number of items
.830	.826	4

**Table 3. Cronbach alpha coefficients for the 8 Item-scale (Teachers)**

Item	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Squared multiple correlation	Cronbach's Alpha if item deleted
1	35.00	849.33	.951	.	.948
2	35.00	728.67	.923	.	.947
3	35.00	736.67	.815	.	.958
4	35.00	822.00	.962	.	.945
5	35.00	904.67	.678	.	.960
6	35.00	800.67	.785	.	.955
7	35.00	772.67	.992	.	.941
8	35.00	876.67	.829	.	.954

**Table 4. Cronbach alpha coefficients for the 4 Item-scale (Students)**

Item	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Squared multiple correlation	Cronbach's Alpha if item deleted
1	75.00	1026.67	.882	1.000	.670
2	75.00	1404.67	.978	1.000	.668
3	75.00	1290.00	.854	1.000	.691
4	75.00	2160.67	.113	1.000	.973

**Table 5. Inter- item correlation matrix for the scale (Teachers)**

S/N	Item	1	2	3	4	5	6	7	8
1	Pearson correlation	1							
	Sig. (2-tailed)	.010							
2	Pearson correlation	.990**	1						
	Sig. (2-tailed)	.010							
3	Pearson correlation	.921	.966*	1					
	Sig. (2-tailed)	.079	.034						
4	Pearson correlation	.885	.847	.733	1				
	Sig. (2-tailed)	.115	.153	.267					
5	Pearson correlation	.514	.492	.426	.834	1			
	Sig. (2-tailed)	.486	.508	.574	.166				
6	Pearson correlation	.793	.706	.511	.918	.680	1		
	Sig. (2-tailed)	.207	.294	.489	.082	.320			
7	Pearson correlation	.985*	.975*	.907	.944	.654	.822	1	
	Sig. (2-tailed)	.015	.025	.093	.056	.346	.178		
8	Pearson correlation	.686	.679	.632	.910	.971*	.718	.802	1
	Sig. (2-tailed)	.314	.321	.368	.090	.029	.282	.198	

\*\*= highly correlated at 1% significance level, \*= significant at 5% significance level (2-tailed)

From Table 5, the correlation between items 2 and 1 with high coefficient of 0.99 was highly significant at 1% significance level while items 3 and 2, 7 and 1, 7 and 2, and 8 and 5 were correlation coefficients of 0.966, 0.985, 0.975 and 0.971 at 5% significance level.

Similarly, Table 6 represents the inter-item correlation matrix of students' response on a 4-item scale on the effects of class size on learning of mathematics.

From Table 6, the inter-item correlation matrix on the 4-item scale indicated that high significance of correlation exists between items 2 and 1, 3 and 1, and 3 and 2 with correlation coefficients of 0.988, 0.957 and 0.950 at 5% significance level.

Table 7 shows the descriptive statistics result for teachers' response on the effects of class size on teaching and learning of mathematics in junior secondary school in *Chikun* L.G.A. of Kaduna State.

From Table 7, respondents' data analysis revealed that most of the teachers agreed that there are too many students in their class and teaching a smaller class would have been more suitable for mathematics. They also agreed that class control is more difficult in a large class and that there are less distractions when students are few. On whether teachers spend a large part of

teaching time on disciplinary problems in a large class, larger percent (65%) agreed while 35% disagreed. The respondents also agreed that class size affects the teaching of mathematics and students learn better in smaller classes than in large classes. On whether students pay more attention in smaller classes, 70% agreed while 30% disagreed with this. The responses of teachers implied that small class size broadly and positively impacts on effective teaching and learning of mathematics in the selected junior secondary schools in *Chikun* L.G.A of Kaduna State.

Table 8 shows the result of statistics of students' response on the effect of class size on learning of mathematics in junior secondary schools in *Chikun* L.G.A of Kaduna State.

From Table 8, most students agreed that mathematics lessons are more interesting when students are few and like mathematics class with fewer students. About 73% of the students agreed that there are too many students in their class while 27% disagreed. Similarly, 56% agreed they are comfortable with their mathematics lesson while 44% disagreed with this. The responses of students implied that mathematics learning in classes with fewer students' impact positively on effective learning of the subject in the selected junior secondary schools in *Chikun* L.G.A of the State.

**Table 6. Inter- item correlation matrix for the scale (Students)**

S/N	Item	1	2	3	4
1	Pearson correlation (2-tailed)	1			
	N	4			
2	Pearson correlation (2-tailed)	.988*	1		
	N	.012	4		
3	Pearson correlation (2-tailed)	.957*	.950*	1	
	N	.043	.050	4	
4	Pearson correlation (2-tailed)	.090	.235	.039	1
	N	.910	.765	.961	4

**Table 7. The effects of class size on teaching and learning of Mathematics (Teachers)**

S/N	Item	SA	A	D	SD	Mean (X)
1	There are too many students in my class	8(40%)	8(40%)	20(10%)	2(10%)	3.10
2	Teaching a smaller class is more suitable for mathematics	11(55%)	9(45%)	-	-	3.55
3	Class control is more difficult in a large class	13(65%)	7(35%)	-	-	3.65
4	There is less distraction when students are few	7(35%)	9(45%)	4(20%)	-	3.15
5	Teachers spend a large part of teaching time on disciplinary problems in a large class	6(30%)	7(35%)	7(35%)	-	2.95
6	Class size affects the teaching of Mathematics	5(25%)	12(60%)	3(15%)	-	3.10
7	Students learn better in smaller classes	9(45%)	9(45%)	2(10%)	-	3.35
8	Students pay more attention in smaller classes	7(35%)	7(35%)	6(30%)	-	3.05

Note: SA = Strongly Agree, A = Agree, D = Disagree and SD = Strongly Disagree

**Table 8. The effects of class size on learning of Mathematics (Students)**

S/N	Item	SA	A	D	SD	Mean (X)
1	Mathematics lesson is more interesting when students are few	47(47%)	35(35%)	10(10%)	8(8%)	3.21
2	I like a class with fewer students	38(38%)	33(33%)	17(17%)	12(12%)	2.97
3	There are too many students in my class	45(45%)	28(28%)	18(18%)	9(9%)	3.09
4	Students are comfortable with their mathematics lesson	16(16%)	40(40%)	32(32%)	12(12%)	2.60

Note: SA = Strongly Agree, A = Agree, D = Disagree and SD = Strongly Disagree

### 3.2 Discussion

From Tables 1 and 2, the high coefficients of 0.96 and 0.83 obtained as Cronbach's alpha for this study indicated the reliability of the scales

and therefore have a strong degree of internal consistency. The finding agrees with findings of Yanico and Lu [27] where they found high reliability in their various scales. The result is in line with Kolawole [28] that a standardized test is

said to have a high reliability coefficient when it is within 0.80 and 0.90 and coefficients ranging from 0.50 to 0.70 are considered reliable.

From Tables 3, the Cronbach alpha coefficients indicate the internal consistency of reliability of the items on the scale while Table 4 indicates Cronbach alpha coefficients for the items on the 4-item scale. The internal consistency of the variable items on scales was within the acceptable range. This also conforms to assertion by Kolawole [28] that a high reliability coefficient is attained when it is within .80 and .90 in a standard test.

**Research Question 1:** Is there correlation between the variables?

From Table 5, the content validation of the scale and variables showed a high correlation coefficient of 0.99 between items 2 and 1 at 1% significance level while items 3 and 2, 7 and 1, 7 and 2, and 8 and 5 had high correlation coefficients of 0.966, 0.985, 0.975 and 0.971 at 5% significant level on the 8-item scale.

Similarly, from Table 6, the inter-item correlation matrix on the 4-item scale indicates that high significant correlations exist between items 2 and 1, 3 and 1 and 3 and 2 with correlation coefficients of 0.988, 0.957 and 0.950 at 5% significance level. The result implied validity of the contents and the scale. This is in line with assertions by Kolawole and Kojigili [29] that realistic and investigative items have to be highly correlated.

**Research Question 2:** How does class size affect the teaching of mathematics?

Analysis of data resulting from teachers' responses indicated in Table 7 shows that large classes are common in the schools and most teachers consider their classes to be too large as reflected by the mean response (3.50). A strong correlation exists between having too many students in the class and teaching a smaller class is more suitable for mathematics (Items 1 & 2) shown in Table 5. This finding corroborates the conclusion of Jacob et al. [30] that large classes are common in secondary schools in Yagba West of Kogi State. The implication of this is that a large class size does not support the teaching and learning of mathematics, smaller classes are more suitable. It also agrees with the findings of Commeyras [31] that effective teaching seems impracticable for teacher

educators having large class sizes of 50, 75, 100 or more. It is a common occurrence to have more than 35 students in a class contrary to the recommendation of the National Policy on Education (NPE) [11].

From Table 8, the students' mean response of 3.21 is an indication that mathematics is more interesting in a small class (item 1). From Table 6, there is a relationship between having an interesting mathematics lesson and a likeness for the class when there are fewer students (items 1 & 2) in Table 5. This implied that class size influences the learning of the subject and it is more desirable with fewer students in the class. A favourable classroom will increase the students' interest and make the learning process easier for both teachers and students. It is believed that teachers are able to focus more on individual students and spend less time on other activities. This finding supports the statement of Agah [2] that in a conventional classroom, the teacher plays the central role by attempting to provide the condition under which learning will occur most successfully for the group of students in a particular class at a particular time. Anthony and Walshaw [32] submitted that teachers need to create an environment that will provide the students with opportunities to build mathematical knowledge.

Similarly in Table 7, there exists a positive relationship between teaching a smaller class as more suitable for mathematics and class control in a large class (items 2 & 3) in Table 5. The mean response (3.65) showed that most mathematics teachers have difficulty in controlling a large or over-bloated class. Teachers also agreed that there are fewer distractions when students are few. The implication is that classroom management would not be thorough, hence teaching and learning become difficult. This agrees with the findings of Blatchford et al. [23] that in smaller classes, classroom management and control are easier and that students in large classes are likely to be distracted and disengaged from allocated work.

Students' response mean (3.09) in Table 8 (item 3) showed that having too many students in mathematics class is disadvantageous in mathematics learning but hardly any other choice. There is a positive correlation between mathematics lessons being interesting with fewer students and having too many students in my class (items 1 & 3) of Table 6. The implication is that the zeal to learn gets diminished under such



circumstances. Students get distracted, discouraged and the subject of learning becomes uninteresting and performance impact can be hampered.

Similarly, there is a relationship between having too many students in the class and students learn better in smaller classes (items 1 & 7) of Table 5. Teachers' response mean of 3.35 in Table 7 is an indication that most students learn mathematics better in smaller classes than in larger class sizes. The implication is that mathematics learning becomes more difficult for most students as class size increases. The finding is supported by the National Centre for Educational Statistics [22] which stated that manageable class size has an impact on student engagement. This also agrees with Bressoux et al. [33] who stated that smaller classes are particularly advantageous to low achieving students.

The result of students' response mean of 2.97 in Table 8 revealed that students agreed they like a class with fewer students in their mathematics classes (item 2). The relationship between students' likeness for mathematics class with fewer students and having too many students in the class (items 2 & 3) is correspondingly positive. The implication is that with smaller class size, students' attention is concentrated with lesser distractions. The skill and method deployed in teaching a mathematical topic can impart a lasting interest in the mind of the students. This is supported by the findings of Oyarinde [34] that teachers' attitude towards teaching and learning of mathematics has a significant impact in shaping the attitude of

students towards learning of the subject. Teachers' helpful behaviour, resourcefulness, enthusiasm, good method of presentation, concern for students and teacher's knowledge of the subject matter are mentioned as impactful.

The teachers' response mean (3.05) in Table 7 showed that class size plays a major role in students' learning of mathematics. This is indicated by percent response distribution over the variable items for the teachers. The correlation matrix in Table 5 revealed that the correlation between spending a large part of teaching time on disciplinary issues in a large class and students paying attention in smaller classes (items 5 & 8) is positive. The mean response implies that, the larger the class, the more distracted the students will be. The nature of mathematics requires students' full attention. This may be difficult in a large class with many possibilities of distraction and this explains why teachers think that a smaller class is better for mathematics learning. This agrees with Jacob et al. [30] who reported a correlation between class size and discipline in secondary schools.

The result showed that teachers perceived that there are more disciplinary issues to deal with in a large class than in a small class and that part of the teaching time is used in dealing with these issues. This corroborates the conclusion of Blatchford et al. [26] that as class size increased there were less on-task and more off-task behaviours. This implication is that there are tendencies for misbehaviour to increase as the class size increases. This makes teachers spend some teaching time to deal with such behaviours thereby reducing the time available for teaching.

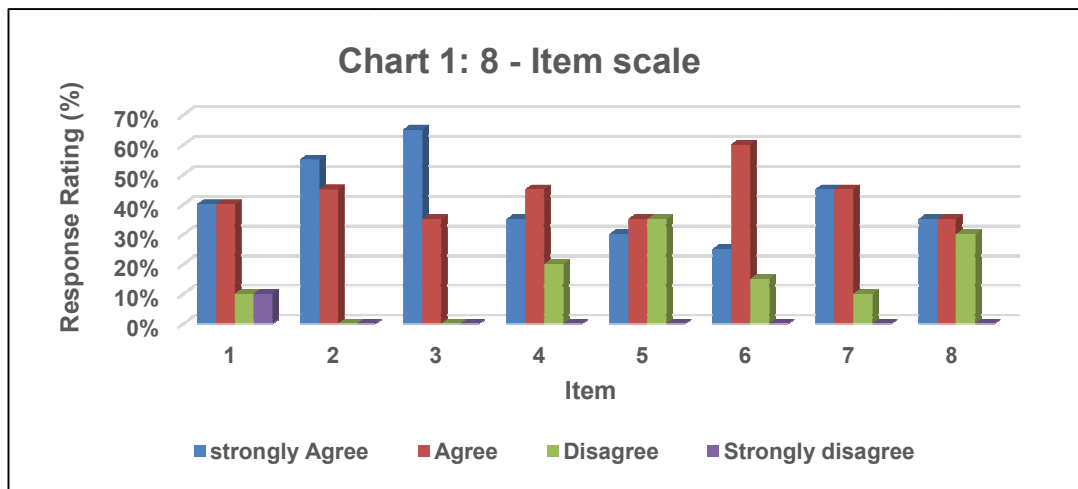
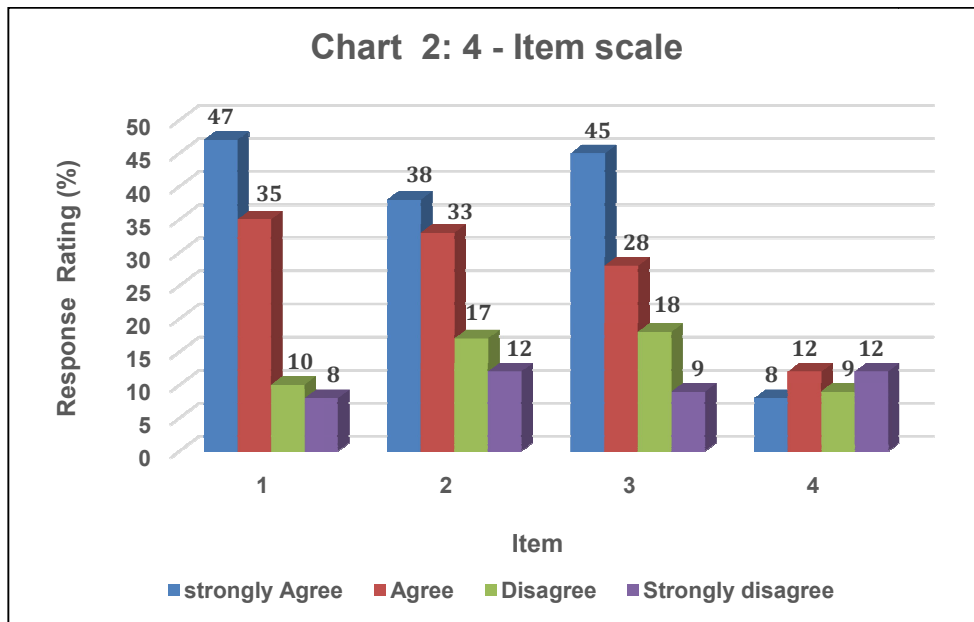


Fig. 1. Teachers' response rating on the effects of class size in mathematics teaching



**Fig. 2. Students’ response rating on the effect of class size in mathematics learning**

The study also revealed that teachers feel that students pay more attention and learn better in smaller classes. It is clear that the ability to pay attention is closely related to learning. Inability to pay attention will create knowledge gaps, making it impossible to relate old ideas with new ones.

The response of teachers on the effects of class size on teaching and learning of mathematics is shown in Fig. 1 of the 8-item scale. The figure shows that majority of the respondents agreed to the statement items (1 – 8) positively than those who disagreed.

Fig. 2 shows the response rating of students to statement items (1 – 4). The Figure indicates a downward trend in respondents’ answers from strongly agree to strongly disagree on the variable items 1 to 3 which is a reflection of the fact that most students strongly agree to have a class with comfortable or fewer numbers during mathematics classes. Item 4 on the Figure shows that an equal number of students shared the opinion that students are not comfortable with mathematics lessons.

**4. CONCLUSION**

The research investigation revealed that most mathematics classes in *Chikun* Local Government Area of Kaduna State are overpopulated, having more than 35 students in

a class contrary to the recommendation of the National Policy on Education (NPE). Teachers and students prefer less populated classes and hold the opinion that teaching and learning of mathematics is better in smaller classes. The teachers’ opinion is based on the fact that class control is easier in smaller classes because there are fewer distractions, less disciplinary issues, students pay more attention and learn better. There exist positive correlations in teachers’ response on having too many students in their mathematics class and class control difficulty in a large class; teaching a smaller class being more suitable and class control issue in a large class; having too many students in their mathematics class and students learn better in smaller classes; teaching a smaller class being more suitable for the subject and better learning by the students in smaller classes and teachers expend much of the teaching time on disciplinary issues in a large class and students are more attentive in smaller classes.

Students’ responses point to the fact that given an opportunity to make a choice, mathematics classes with fewer students would be a preferred choice, although an equal number of them are not comfortable with mathematics lessons. The students’ responses are correlated in having interesting mathematics lessons when students are few and likeness for a class with fewer students; having too many students in

mathematics class and having interesting mathematics lessons when students are few; and likeness for a mathematics class with fewer students and having too many students in mathematics class.

The size of a mathematics class can affect how the teacher implements the curriculum, the method of teaching deployed in the classroom consequently affects the work quality of the teacher. It can be concluded that class size is a major contributor to students' poor grades in mathematics. It is therefore important to structure the learning environment in such a way that each student can receive adequate attention that will spur their interest and enhance a better learning opportunity in mathematics.

## 5. RECOMMENDATIONS

The following recommendations are made based on the findings of this aspect of the research work.

- The ministry of education and schools administrators should enforce the recommendations of the National Policy on Education (NPE) concerning class size by providing facilities to cater for the secondary school population in *Chikun* Local Government area of Kaduna State.
- Once changes in class size have been implemented, students' scores should be monitored to provide evidence that class size reduction can make a difference in the mathematics learning process.
- Further research studies on the subject matter could be conducted and extended to the senior secondary school classes of the same and other local government areas of Kaduna State.

## 6. LIMITATIONS OF THE STUDY

The study was time bound and location specific thereby leading to the small sample sizes for teachers and students. This limits the application of the results to the rest of the population. The researcher also encountered reluctance to the filling of the questionnaire in some schools.

## CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline participant consent and ethical approval has been collected and preserved by the authors.

## ACKNOWLEDGEMENT

The authors acknowledge the contribution of National Teachers Institute, Kaduna under which the study was supervised.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Agah MP. Challenges of mathematics in economic development in the twenty-first century: Implications for tertiary education. *Journal of Education, Society and Behavioural Science*. 2020;33(3):20-25. Article no.JESBS.55857.
2. Agah MP. The relevance of mathematics education in the Nigerian contemporary society: Implications to secondary education. *Journal of Education, Society and Behavioural Science*. 2020;33(5):36-43. Article no.JESBS.56754.
3. Yara PO, Otieno KO. Teaching/learning resources and academic performance in mathematics in secondary schools in Bondo District of Kenya. *Asian Social Science*. 2010;6(12).
4. Gouba L. The importance of mathematics in everyday life; 2008. Available:users.aims.ac.za
5. Laju I. Why students fail mathematics; 2015. Available:www.vanguardngr.com
6. Olatunde YP. Class size and students' mathematics achievement of senior secondary schools in South Western Nigeria. *The Social Sciences*. 2010;5(2):108-112.
7. Sa'ad TU, Adamu A, Sadiq AM. The causes of poor performance in mathematics among public senior secondary school students in Azare metropolis of Bauchi State, Nigeria. *Journal of Research and Method in Education*. 2014;4(6):32-40.
8. Grauws DA, Cebulla KJ. Improving student achievement in mathematics; 2000. Available:www.ericdigest.org/2003-1
9. Ayeni OG, olowe MO. The implication of large class size in the teaching and learning of business education in Tertiary Institution in Ekiti State. *Journal of Education and Practice*. 2016;7(34):65.

10. Tobih DO, Akintaro OA, Osunlana DO. Effect of class size reduction on students' performance in mathematics in JSSCE examination in Ibadan Municipal. *Int. Journal of Edu. Res.* 2013;1(4):165–178.
11. Federal Government of Nigeria. National Policy on Education and 4 year strategic plan for the development of the education sector: 2011 - 2015. 6<sup>th</sup> Edition. Publishers: NERDC Press, Yaba, Lagos. 2013;9-11.
12. Ajao W. Nigeria education: How large classes reduce quality of learning; 2004. Available:allafrica.com
13. Mathis WJ. The effectiveness of class size reduction; 2016. Available:<http://nepc.colorado.edu/publications/research-based-options>
14. Babcock P, Betts JR. Reduced-class distinctions: Effort, ability and the education production function. *Journal of Urban Economics.* 2009;65:314-322.
15. Kornfeld M. The effects of class size on student academic achievement in a rural state. Ph.D. Dissertation. Vermont: The University of Vermont; 2010.
16. Ngoboka P, Schultz B. The effect of class size on student academic performance in a principles of microeconomics course. *Proceeding of the Midwest Business Economics Association.* 2002;198-207.
17. Keil J, Partell PJ. The effect of class size on student performance and retention at Binghamton University. Office of Budget & Institutional Research Binghamton University. Binghamton, NY; 2009.
18. Uhrain CE. Effect of class size on student achievement in secondary school. Walden University. A Ph.D Thesis Submitted to the University of Walden. 2016;32–33.
19. Owoeye J, Yara P. Class size and academic achievement of secondary school in Ekiti State, Nigeria. *Asian Social Science.* 2011;7(6):184-189. Available:<http://aessweb.com>
20. Middleton JA, Spanias PA. Motivation for achievement in mathematics: Findings, generalizations and criticism of the research. *Journal for Research in Mathematics Education.* 1999;30(1):65-88.
21. Leon KE. Factors that influence the understanding of good mathematics teaching. *Eurasia Journal of Mathematics, Science & Technology Education.* 2013;9(3):319-328.
22. National Center for Education Statistics. Monitoring school quality: An indicator report. U.S Department of Education; 2000.
23. Blatchford P, Basset P, Goldstein H, Martin C. Are class size differences related to pupils' educational progress and classroom processes? Findings from the Institute of Education. *Class size study of children aged 5 - 7 years.* *British Educational Research Journal.* 2003;29(5): 709-730.
24. Fidler P. The impact of class size reduction on student achievement. Retrieved from [classsize.matters.org](http://classsize.matters.org); 2001.
25. Osim RO, Uchendu CC, Ubi IO. Class size pressure: An impediment to teachers' work quality. *Global Advanced Research Journal of Education Research and Review.* 2012;1(5):95-99.
26. Blatchford P, Basset P, Brown P. Examining the effects of class size on classroom engagement and teacher-pupil interaction: Differences in relation to pupil prior attainment and primary vs secondary schools. *Learning and Instruction.* 2011;21:715-73.
27. Yanico BJ, Lu TGC. A psychometric evaluation of the six-factor self-concept scale in a sample of racial/ethnic minority women. *Educational and Psychological Measurement.* 2004;60(1):86–99.
28. Kolawole EB. Principles of test construction and administration (Revised Ed.) Bolabay Publications; 2011.
29. Kolawole EB, Kojigili ST. Development and validation of a self-concept and attitude scale for senior secondary school students in Nigeria. *British Journal of Education, Society and Behavioural Science.* 2015;7(1):42-49. Article no.BJESBS.2015.070.
30. Jacob OA, Olawuyi BO, Jacob AJ. Relationship between class size and discipline of secondary school students in Yagba West of Kogi State, Nigeria. *Sky Journal of Educational Research.* 2016;4(1):8-13.
31. Commeyras M. Promoting a culture in reading. *The Comet Thursday,* February 13. 2000;32.
32. Anthony G, Walshaw M. Effective pedagogy in mathematics. *Educational practices series 19.* International Academy of Education; 2009. Available:[www.ibe.unesco.org](http://www.ibe.unesco.org)

33. Bressoux P, Kramarz F, Prost C. Teachers' training, class size and students' outcomes: Learning from administrative forecasting mistakes. IZA Discussion Paper (3871); 2008. Available:papers.ssrn.com
34. Oyarinde ON. Effect of computer game-based instructional strategy on students' learning outcome in mathematics. Journal of Education, Society and Behavioural Science. 2019;29(4):1-15. Article no.JESBS.15732.

---

© 2020 Afolabi et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*  
*The peer review history for this paper can be accessed here:*  
<http://www.sdiarticle4.com/review-history/62110>